

*Charadracarus* new genus, Charadracarinae new subfamily  
(Acari, Johnstonianidae),  
and the Status of *Typhlothrombium* Berlese 1910

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BERLESE AND LEONARDI (1901: 17) described a mite from Argentina which they named *Trombidium bistricinum*. The species was described as follows: Dark cinnabar, large, broad-shouldered, flattened dorsally, rounded posteriorly. Body setae 25  $\mu$  long, sharp, spiniform, cinnabar, dense. Cephalothorax nude, except in median portion. Crista metopica linear, a tubercular elevation posteriorly, containing the areolae. Palpal tarsus long, clavate, extending beyond the claw; tibia with an ornate series of six spines along the internal surface, a single terminal claw. Legs rather long, setae plumose, irregularly ornate. Tarsus I at least five times longer than broad. I was unable to see eyes by any means. Adult 3 mm. long. One specimen collected at St. Pedro Mission, Argentina. (Author's translation.) No figures were given.

Berlese (1910: 358) designated *Trombidium bistricinum* as type species of the new genus *Typhlothrombium*. The original description of the genus was very brief, including little beyond the original description of the type species, except for the fact that a nasus was present. Characteristics set forth in the original description of the genotype which are at variance with descriptions of the two species subsequently placed in this genus (*Typhlothrombium grandjeani* André 1930, *Typhlothrombium aelleni* Cooreman 1954) are: the dark red color, flattened dorsum, the very short setae (25  $\mu$ ), the denseness of the chaetotaxy, the presence of a well-developed ctenidium, the slender form of tarsi I, and the large size of the body (3 mm.). The differences are so considerable as to leave no doubt that *Typhlothrombium grandjeani* and *Typhlothrombium aelleni* have nothing to do, at the generic level, with *Typhlothrombium bis-*

*tricinum*. The only unusual feature pointed out up to this time which is shared by *Typhlothrombium bistricinum* on the one hand and *T. grandjeani* and *T. aelleni* on the other hand is the absence of the eyes. This is not a very significant point of similarity, however, in light of the many points of difference noted above. The genus *Typhlothrombium* Berlese 1910 therefore must be restricted to the type species. The family status of *Typhlothrombium* is uncertain, but it is provisionally retained in the Trombidiidae.

The author has had the opportunity of studying a form very similar to *Typhlothrombium grandjeani* André, which occurs in southern California. A second North American species, from Point Barrow, Alaska, has been collected by Dr. Paul Hurd of the University of California at Berkeley. Finally, through the courtesy of Dr. Marc André, I have been able to study type material of *Typhlothrombium grandjeani*. These three species, together with *Typhlothrombium aelleni* Cooreman comprise a natural group of congeners, *Charadracarus* new genus, with *C. hurdi* new species as the genotype.

The genus is unusual in several important respects although it is obviously closely related to the Johnstonianidae. While there are important points of difference between the species of *Charadracarus* and other members of the Johnstonianidae, it appears that these differences can be suitably recognized by establishing a new subfamily within the Johnstonianidae.

ACKNOWLEDGMENTS

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**CHARADRACARINAE** new subfamily

Since the genus *Charadracarus* is the only one known at the present time, the characteristics of the subfamily are the same as those of the genus. The most significant characters which separate the *Charadracarinae* from the other subfamilies of the Johnstonianidae are: (1) the presence of only two pairs of genital acetabula in the adult, (2) the single pair of genital sclerites (the paragenitals apparently being absent), (3) the absence of tracheae in both larvae and adult, (4) the undivided femur in legs III and IV of the adult and in leg III of the larva. The absence of corneae and ocular plates is important, but the same condition has been reported in *Crossothrombium parkbousei* Womersley 1939, as well as in *Typhlothrombium histricinum* (Berlese and Leonardi) 1901.

The habits are not well known. The larvae are almost certainly of the self-detaching type and may be simple predators on small soil organisms. The predatory nature of the larvae is surmised from the fact that they have never been found on a host, in combination with the fact that they show a great variation in size in the soil, indicating that they are feeding and growing. The larvae are almost colorless and adults are pale yellow to white—not dark brown or red like other Johnstonianidae. The writer has found them in large numbers in the winter under black oak (*Quercus kelloggii* Newberry) in the mountain ranges of southern California. This oak usually grows in situations where soil moisture is more abundant than in other places, either in deep gullies or on north slopes, etc. Thus, while *Charadracarus* deviates more than other known Johnstonianidae from a subaquatic habitat, their ecological distribution is still relatively restricted. At the type locality of *C. delitescens*, hundreds of individuals were found under the oaks on the south side of a gully, but the species was totally absent from the northern side of the gully where only the coast live oak (*Quercus agrifolia* Neé) was found.

**CHARADRACARUS** new genus

**ADULTS:** Idiosoma rather small, less than 1 mm. in length; color pale yellow to white. Scutum with sensilla bearing a bulblike expansion

in known forms; prosensilla more than one half as long as the sensilla, but markedly different from the sensilla, more closely resembling the other setae of the scutum. Anterior end of scutum drawn out into a long sharp spine closely appressed to the dorsal wall of the propodosoma. Dorsum of gnathosoma without spiracular openings. No major tracheal trunks associated with cheliceral apodemes internally. Dorsum of propodosoma with no setae lateral to scutum. Corneae and eyes absent. Chaetotaxy of hysterosoma simple, setae only a little more numerous than in the larva. Genital opening bordered by only one pair of sclerites; paragenital sclerites absent. Two pairs of genital acetabula in both sexes. Pregenital tubercle absent. Anus lying in the completely undifferentiated ventral cuticle between the genital opening and the posterior end of the body; no trace of anal sclerites or anal setae. Anterior wall of trochanter of palp with no trace of a fenestra. Palpal tibia with or, usually, without paradont. Solenidion of palpal tarsus basal in position. Eupathidia confined to tarsi I and II, absent from tarsi III and IV and all other segments of the legs. Supracoxal setae absent from gnathosoma and coxa I; vestigial setae also completely absent. Solenidia<sub>1</sub> and s<sub>2</sub> only moderately differentiated but s<sub>2</sub> distinctly shorter and straighter than s<sub>1</sub>. s<sub>3</sub> and s<sub>4</sub> convergent in form, s<sub>4</sub> only a little heavier and with a little more distinct internal structure in typical cases, but intermediate forms exist which are unassignable to either category.

**LARVA:** Scutum with four pairs of setae, the prosensilla more like the other setae of the scutum than like the sensilla. Nasus sharp, closely appressed to the dorsal surface of the propodosoma. Crista metopica feebly developed, confined to the portion of the scutum behind the areae sensilligeræ. Ocular plates absent. Coxal setae numbering 2–1–2. Urstigma present and well developed. A number of setae in the membranous cuticle between coxae II and III. Anal sclerites absent. Deutorostral setae apparently absent, rostrum with only the proto- and tritorostrals. Anterior wall of palpal trochanter not fenestrated. Terminal setae of palpal tarsus not typically eupathidiform, but flattened and heavy walled. Tarsal eupathidia numbering



2-1-0,  $e_d$  of tarsus I with basal companion seta.  $S_4$  of tibia I without companion seta. Supracoxal setae absent on gnathosoma and coxa I; vestigial setae absent from patella and tibia of all legs. Femora I and II divided, six free segments beyond the coxa; III undivided, only five free segments beyond the coxa. All tarsi with two nearly equal claws, the posterior ones a little larger and more erect than the anterior ones. Intercoxal area with more than one pair of setae between coxae II and III.

REMARKS: The genus is remarkable for the way in which the larval characters have, in many cases, been carried over into the adult with little change. The general body form is strikingly similar in both stages, and the chaetotaxy of the body is nearly as simple in the adult as it is in the larva. Perhaps the greatest similarity in the two instars is in the structure and chaetotaxy of the appendages. In the larva of *C. delitescens*, the chaetotaxy of the palpal tarsus is very reminiscent of that found in *Johnstoniana*, *Diplo-trombidium*, and *Centrotrombidium*, being virtually identical with the latter. In these three genera, however, the two or more dorsal and distal setae of the tarsus (which evidently are modified eupathidia) are replaced in the adult by typical eupathidiform setae. In *Charadracarus delitescens*, on the other hand, these setae are easily recognizable in the adult and have almost precisely the same form that they had in the larva. The total number of setae on the palp of the adult is increased only a little over that of the larva, and there is usually (exception: *C. aelleni*) no development of the paradont on the palpal tibia such as occurs in all the other genera of the Johnstonianidae.

The femur, which is undivided in leg III of the larva remains undivided in the adult, too, and femur IV also has no trace of a subdivision. In both larva and adult, the eupathidia are confined to tarsi I and II; moreover there is no proliferation whatever of the eupathidia on tarsus II, there being a single eupathid in both larva and adult. There is an appreciable increase in the number of eupathidia on tarsus I. There is a single solenidion<sub>1</sub> on tarsus I of the adult just as in the larva, whereas in other genera there is often an increase in the number of  $s_1$  in the transition from larva to adult (*Centro-*

*trombidium*, *Johnstoniana*). In all these characteristics, the members of the genus appear to be highly neotenic. The presence of numerous setae in the intercoxal area of the larva is, on the contrary, a typically postlarval characteristic.

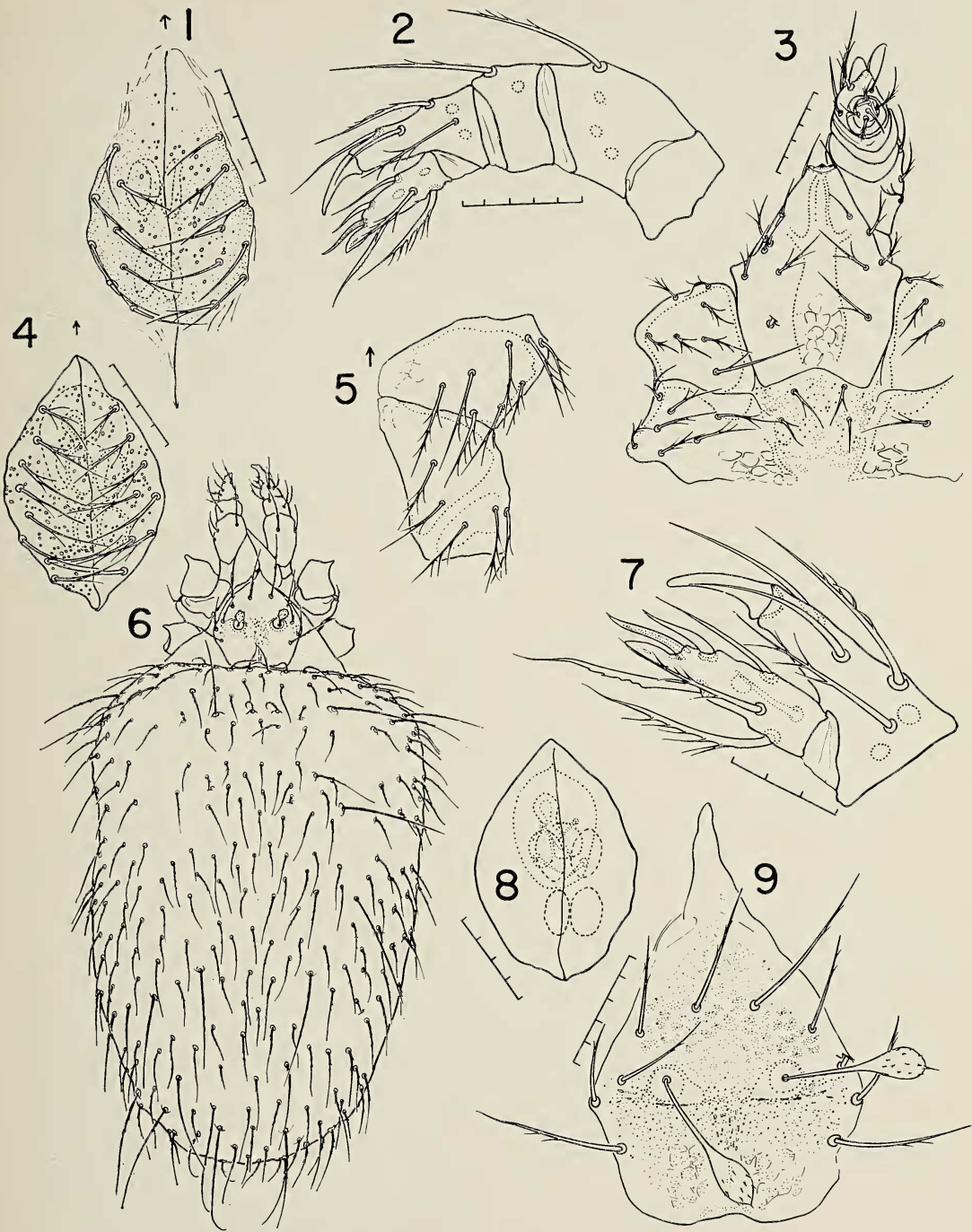
TYPE SPECIES: *Charadracarus hurdi* new species.

#### CHARACTERS SHOWING INTERSPECIFIC VARIATION IN THE GENUS CHARADRACARUS

The known species of this genus show a high degree of homogeneity in structure. The observed differences, in many cases, are so minor that the possibility of environmental influences can not be dismissed. However, until the existence of such influences have been proved experimentally, we must assume that the observed differences have actual specific value. The structures exhibiting variants of specific value are discussed here briefly, and are then summarized in a formula key.

*Sensilla.* At least two types of sensilla occur in the genus. In all known species but *C. hurdi*, the sensilla are fusiform, with a club-shaped swollen portion at the end of a long slender stalk, and beyond this the shaft of the seta tapers to a fine point. The portion of the shaft proximal to the swelling is nearly the same length as the portion distal to the swelling. In *C. hurdi*, the distal portion is almost completely wanting; an indication of it is seen only at high magnification (Fig. 9). In both types, the swollen portion of the sensillum bears a number of fine points.

*Setae of Hysterosoma.* In the adults of all described species, there are two series of setae, major and minor, the minor setae being smaller and much more numerous than the major. Cooreman (1954: 14-17) indicated that there are six pairs of major setae in *C. aelleni*. The number and arrangement in the three species studied by the writer are not especially regular. The distinct interspecific differences are found, however, in the form of the major setae. In *C. hurdi* and *C. aelleni*, the major setae are like the minor in the filiform tips. In the remaining two species, on the other hand, the tips of the major setae are distinctly swollen and bear a tuft of fine barbs. The terminal tuft of barbs in



FIGS. 1-9. *Charadracarus burdi*, n. sp., adult: 1, genital area, female; 2, right palp, anterior, female; 3, prosoma, female; 4, genital area, male; 5, left coxae III and IV, female; 6, dorsum, male (same scale as Fig. 31); 7, tibia and tarsus of palp, anterior, female; 8, genital area, male, with external detail omitted; 9, scutum, female.



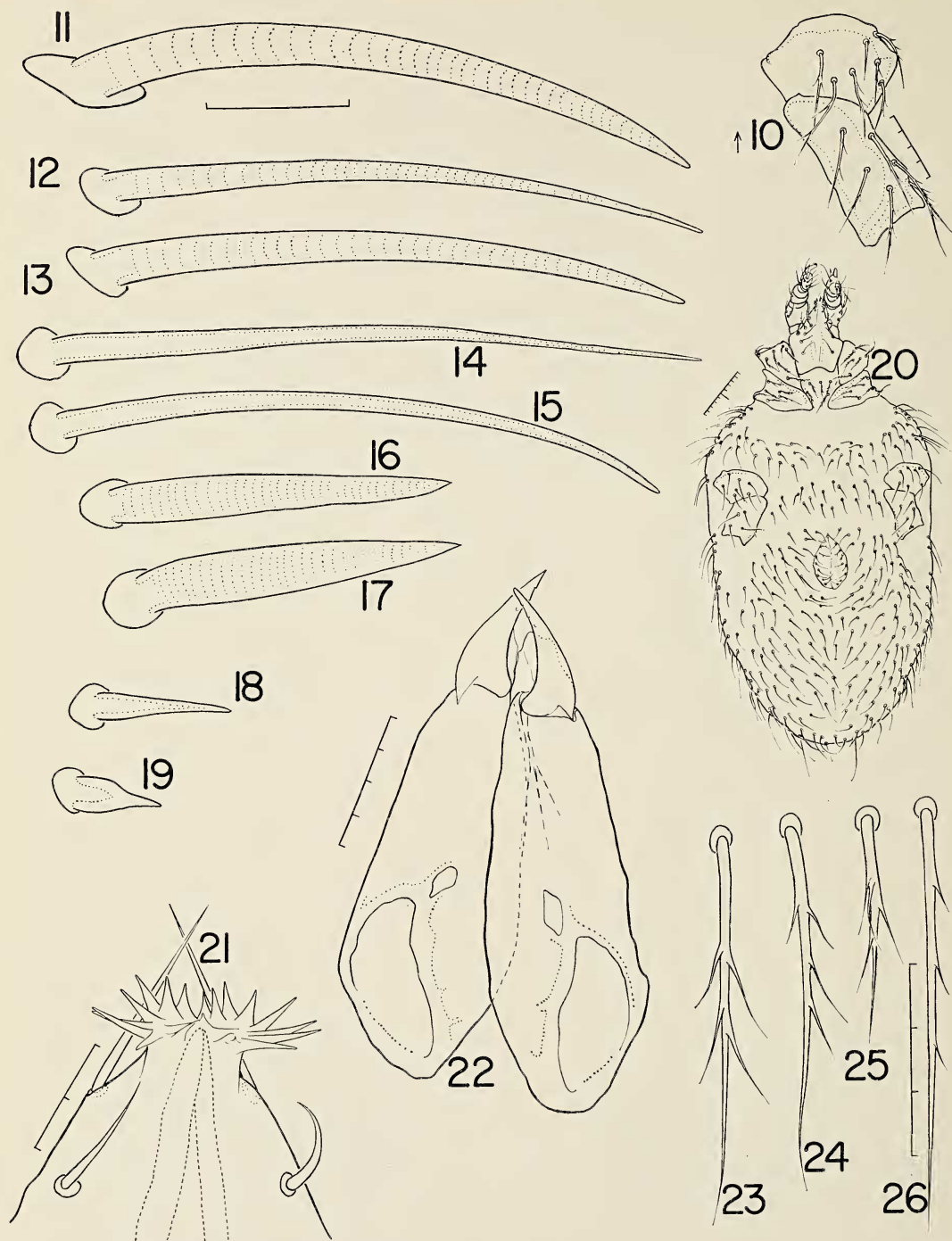
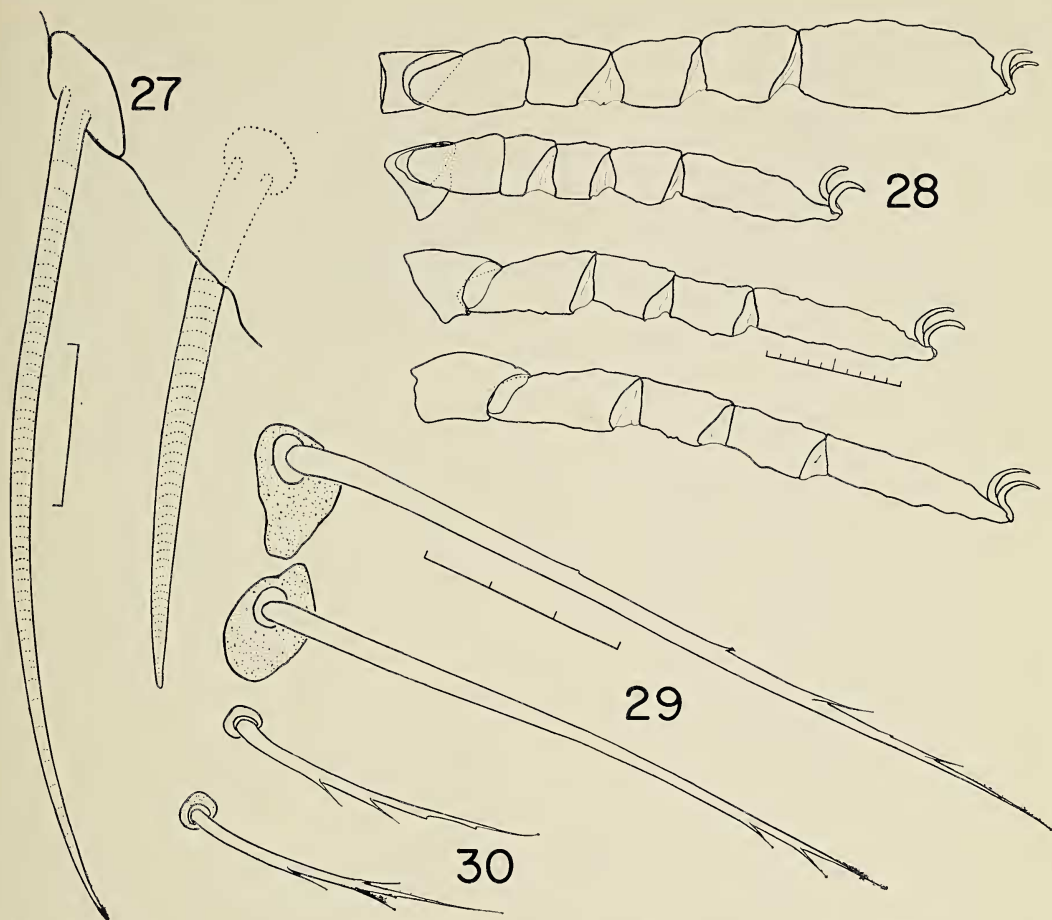


FIG. 10. *Charadracarus delitescens*, n. sp.: coxae III and IV, female.

FIGS. 11–26. *Charadracarus burdi*, n. sp., adult: 11,  $s_1$ , tarsus I; 12,  $s_4$ , tarsus I; 13,  $s_4$ , tibia I; 14,  $s_3$ , tibia I; 15,  $s_3$ , telofemur I; 16,  $s_2$ , tarsus I; 17,  $s_2$ , tarsus II; 18,  $f_1$ , tarsus I; 19,  $f_2$ , tarsus II; 20, venter, male; 21, tip of rostrum, ventral, male; 22, chelicerae, semi-ventral; 23, seta, coxa II; 24, seta, coxa IV; 25, 26, ventral body setae. (Figs. 23–26 drawn from female.)



FIGS. 27–30. *Charadracarus hurdi*, n. sp., adult: 27, dorsal solenidia of tibia IV; 28, outline drawings of legs I–IV, female; 29, major body setae, female; 30, minor body setae, female.

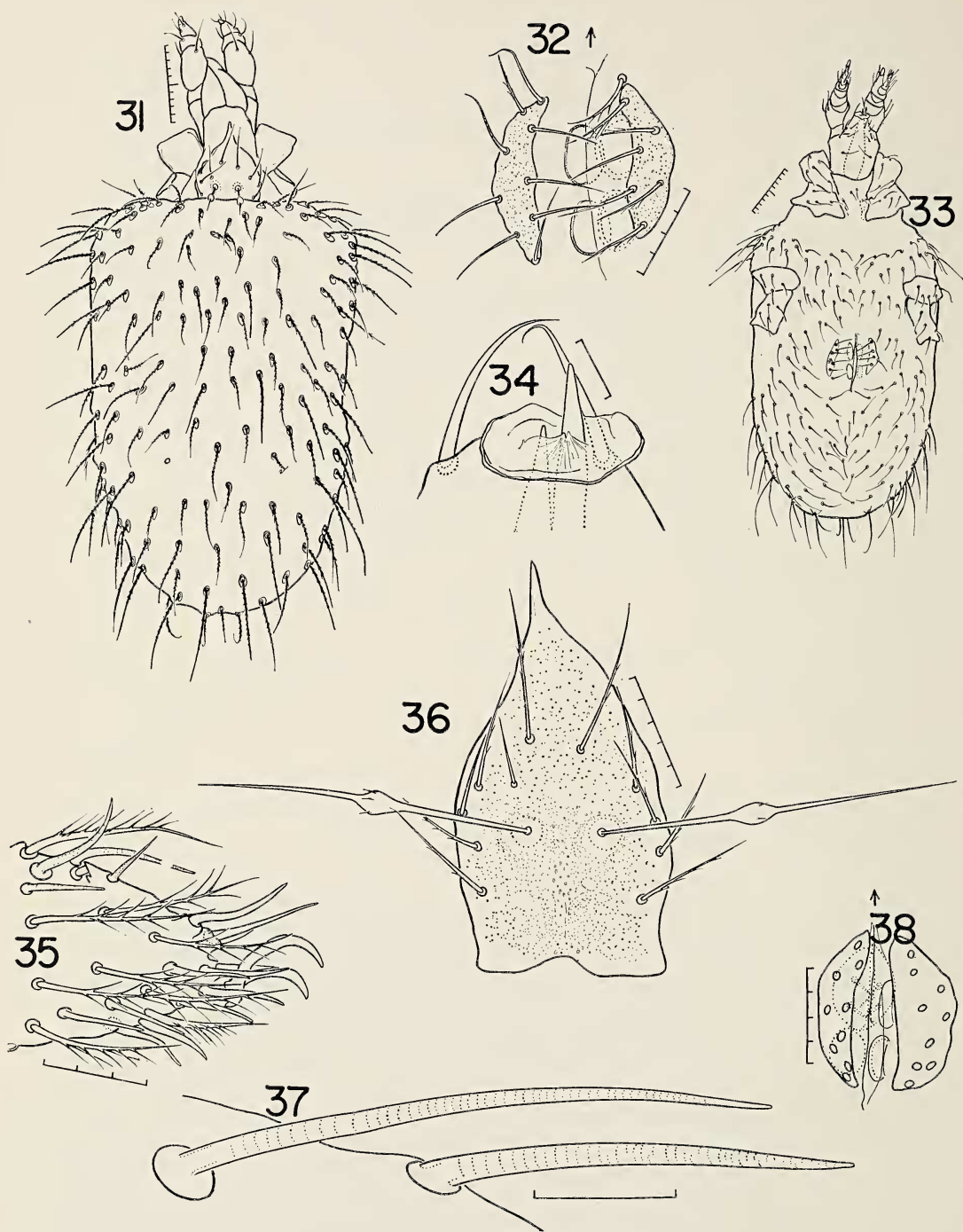
*C. delitescens* and *C. grandjeani* has no counterpart in the other two species (cf. Figs. 29 and 45). The terminal portion of the major setae of *C. delitescens* and *C. grandjeani* is cavitated. The number and arrangement of the dorsal hysterosomal setae also show some differences, although these are not as easy to utilize in differentiating between species as are some of the other characters (compare Figs. 6 and 31).

*Eupathidia of Palpal Tarsus.* In the adult of *C. hurdi*, the most distal of the two distidorsal setae has a hollow shaft and is typically eupathidiform in structure. Its more basal counterpart is solid, except for a very slight and almost unnoticeable basal excavation. In adults of *C. delitescens*, both of these setae are solid. In the larva of *C. delitescens* (Fig. 72) the terminal eupathid

is canaliculate in the basal portion, but this condition does not persist in the adult, at least in the specimens examined by the writer. The situation in *C. aelleni* is unknown, but in the type of *C. grandjeani*, the distal one is hollow, as in the case of *C. hurdi*.

*Paradont of Palpal Tibia.* In his original description of *C. aelleni*, Cooreman showed a distinct and well-formed paradont at the base of the terminal odontus of the palpal tibia. None of the other three species of the genus has such a seta in this position. It would appear that the paradont is not an additional seta in the case of *C. aelleni*, for the setae of the tibia of that species are the same in number as in the other three species of the genus. The only difference appears to be that one of the normal setae in





FIGS. 31-38. *Charadracarus delitescens*, n. sp., adult: 31, dorsum, female; 32, genital area, female; 33, venter, female; 34, tip of rostrum, female; 35, end of tarsus I, posterior, female; 36, scutum, female; 37, solenidia of tibia IV, female; 38, genital area, male.

*C. aelleni* has moved distally and become modified in form and size.

*Structure of Rostrum.* An interesting feature in the structure of the tip of the rostrum is found in *C. hurdi* and *C. delitescens*. This is a sexual difference, and not an interspecific one. In the females, the tip of the rostrum is simple, the velum being a flattened and fairly regular disc (Fig. 34). In the males of both species, however, the velum is rather elaborately drawn out around the margins into a number of fine points (Fig. 21).

FORMULA KEY TO SPECIES OF  
CHARADRACARUS

Based on Adults

- 1a. Sensilla fusiform, greatly swollen near middle, the tapering distal portion of the sensillum as long as or nearly as long as the basal portion (Fig. 36).
- 1b. Sensilla essentially clavate, filiform distal portion greatly reduced or absent (Fig. 9).
- 2a. Major setae of hysterosoma tapering to a fine point, no terminal tuft of barbs (Fig. 29).
- 2b. Virtually all major setae of hysterosoma with distal end inflated, hollow, and with a tuft of fine barbs (Fig. 45).
- 3a. Tarsus of palp with terminal seta eupathidiform, hollow throughout most of length (Fig. 7).
- 3b. This seta solid throughout virtually the entire length of the shaft, not eupathidiform (Fig. 48).
- 4a. Tibia of palp with a terminal odontus plus six slender, tapering normal setae; paradont absent (Figs. 7; 44).
- 4b. Tibia of palp with a terminal odontus and a paradont (Cooreman, 1954: 17, fig. 8).
- 5. Length of idiosoma, to tip of nasus, by sex.

NOTES ON MORPHOLOGY AND TERMINOLOGY  
IN THE PARASITENGONA

In a previous paper, the writer (1957: 407), presented a table of terms applied to the specialized setae of the legs of the Parasitengona in which "microfemorala, microgenuala, microtibiala (in part)" were listed as equivalent to solenidion<sub>3</sub> or s<sub>3</sub>. The prefix *micro* should be deleted from each of these names. Likewise, solenidion<sub>4</sub> or s<sub>4</sub> has as its equivalent the term *tibiala* (in part)—not microtibiala as erroneously indicated in the table.

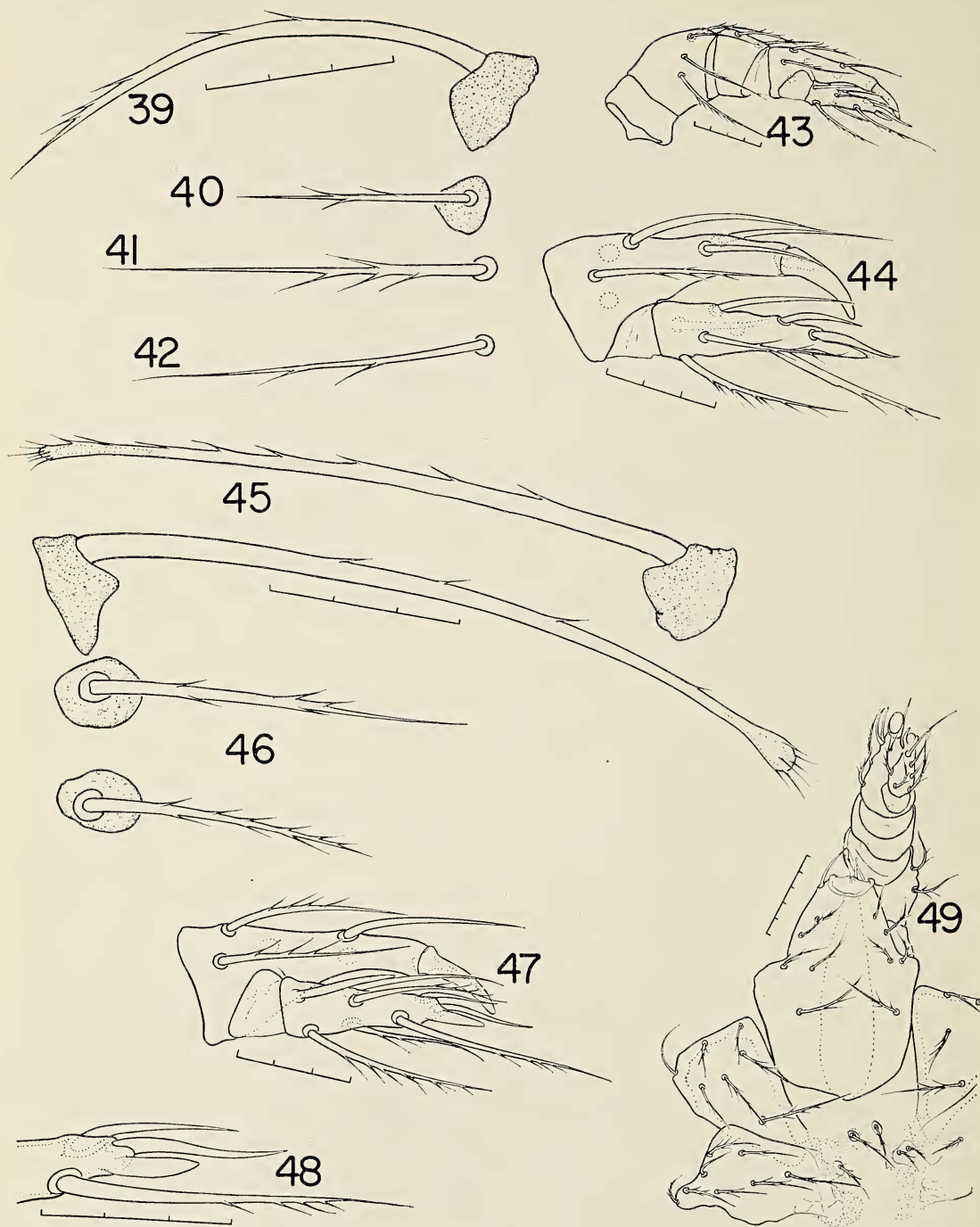
The term *prosensillar setae* was introduced by the writer (1958: 360–367) but was not defined. It had been shown in an earlier study (Newell, 1957: 398–400) that the most anterior setae of the scutum of Johnstonianidae could be (a) present and typically sensillar in form, closely resembling the posterior sensilla, (b) present, but more nearly resembling the other setae of the scutum than they do the sensilla, and (c) absent. In those Johnstonianidae, Trombiculidae, and Trombidiidae in which the homologues of the anterior sensilla are present but not sensilliform, these setae may be designated by the term *prosensilla*. These are typically the two anteromedian setae of the scutum. In many Trombiculidae, they are represented by an unpaired anteromedian *prosensillum*.

In the same paper (p. 384) the terms *odontus* and *paradont* were introduced. The name *odontus* is applied to the heavy terminal clawlike seta found on the tibia of the pedipalp. The term is utilized in preference to "claw," to avoid the implication of relationship to the tarsal claws. There is no relationship between the two types of "claw" in position, structure, or function, and different terms are desirable for the two kinds of structure. In many species a second and subterminal seta is found, usually quite near the insertion of the odontus, and this has been called the *paradont*.

DISTRIBUTION OF CHARACTER VARIANTS, ADULTS

	1	2	3	4	5
<i>C. hurdi</i> n. sp.....	b	a	a	a	♀ 711 μ
<i>C. delitescens</i> n. sp.....	a	b	b	a	♀ 513–711 (628)
<i>C. grandjeani</i> (André).....	a	b	a	a	♀ 504
<i>C. aelleni</i> (Cooreman).....	a	a	?	b	900





FIGS. 39-49. *Charadracarus delitescens*, n. sp., adult, female: 39, 40, two ventral hysterosomal setae; 41, seta of coxa IV; 42, seta of coxa II; 43, palp, posterior; 44, tibia and tarsus of palp, anterior; 45, major dorsal and marginal hysterosomal setae; 46, ventral hysterosomal setae; 47, tibia and tarsus of palp, posterior; 48, tip of tarsus of palp, posterior; 49, prosoma, ventral.

*Charadracarus hurdi* new species

FEMALE: Idiosoma of holotype 711  $\mu$  long, 459  $\mu$  wide, length/width 1.54. Scutum of essentially same form as found in *C. delitescens*, but sensilla not fusiform. Swollen distal portion with a number of small refractile points, and only a vestige of the shaft at the tip. Prosensillar setae considerably longer than the others. Setae appearing barbed at high magnifications, but relatively smooth at magnifications of 150 $\times$  or lower. Posterior margin of plate rather deeply notched, and immediately anterior to the notch is a weakly defined, short, narrow crista. Cuticle faintly pigmented, yellow-brown in color. Ocular plates totally absent. Dorsal propodosomal setae of two series, major and minor, the major setae larger than the minor, but otherwise not differing in form (Figs. 29, 30). The tips taper uniformly to a very fine point, and are not expanded or tufted as in *C. delitescens* (Fig. 45). Setigerous sclerites very minute and difficult to observe. Coxa I with eight barbed setae each, supracoxal setae absent; coxal ring slightly open dorsally. Coxa II with seven or eight setae. Pars medialis coxae and intercoxal area as in *Charadracarus delitescens*. Coxae III and IV with six to eight setae each, usually eight. No trace of either apodemes or *Lassenia*-organ in membranous cuticle between II and III.

Base of gnathosoma and rostrum essentially as in *C. delitescens*. Chelicerae not in favorable position for study, but with only three feebly developed teeth behind the tip. Dorsal membrane well developed, slightly longer than one-half the length of the tarsus. Palpi with five free segments, trochanter with no indication of a fenestra on anterior surface. Femur with one seta dorsally and three setae on posterior margin, patella with two dorsal setae, tibia with six setae plus the terminal odontus (Figs. 2, 7). Tarsus with a solenidion very near the base of the segment plus seven setae more distally located. Of these, the two distidorsal ones are the heaviest and shortest, and are also smooth. The distal one of these two setae is typically eupathidiform with a distinct central canal and a moderately thick wall. Its homologue in *C. delitescens* is solid in several specimens examined by the writer. In the present species, the more proximal of these two setae is solid, with-

out a central canal. The tip of the palpal tarsus is drawn out into a fingerlike projection.

Femora I and II divided, III and IV undivided. Eupathidia confined to tarsi; vestigial setae absent. Tarsus I with a single  $s_1$  at 0.72–0.74; usually with one or two  $s_2$  between 0.56 and 0.65, one on anterior and one on posterior aspect of tarsus. Famulus<sub>1</sub> at 0.82. Approximately 16 or more eupathidia between 0.53–0.57 $v$  and 0.72–0.77 $d$ . Tarsus II with a single  $s_2$  at 0.54–0.55,  $f_2$  at 0.46–0.47, and a single eupathid at 0.88 $p$ . Tarsi III and IV each with a single  $s_3$  at 0.12–0.32, the basal position probably more common. Remaining chaetotaxy essentially as in *C. delitescens*. Special features common to the two species are the slightly acuminate tips of  $s_2$  and the apparently consistent difference in size of the dorsal solenidia of tibia IV (Figs. 27, 37).

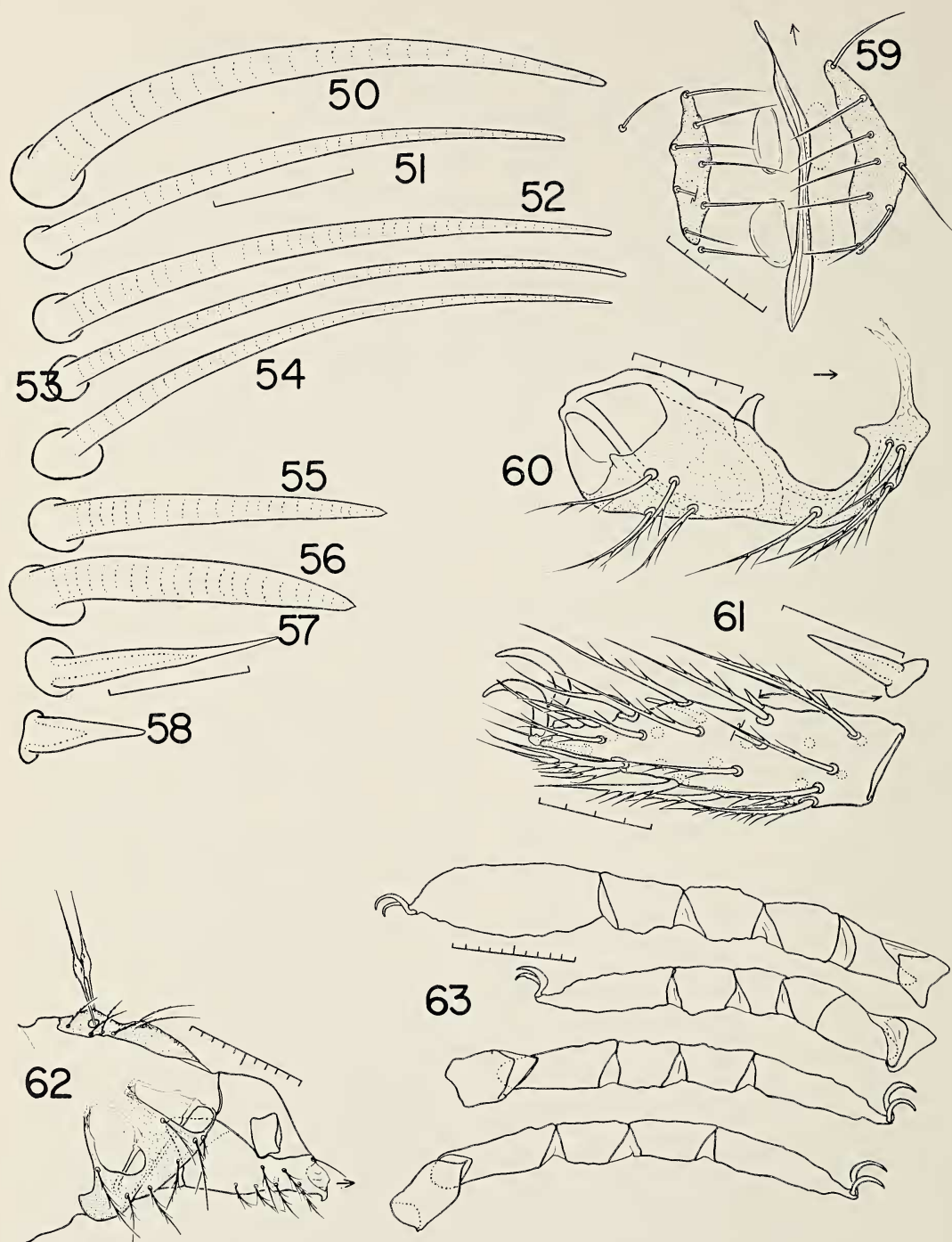
TYPE LOCALITY: Point Barrow, Alaska, collected by Paul Hurd, Jr.

REMARKS: This species is very similar to *C. delitescens* new species, and to *C. grandjeani* (André). The most significant differences are in the form of the sensilla, and the difference in structure of major setae of the dorsal and marginal surfaces of the hysterosoma. The difference in form of the distal member of the group of two dorsal eupathidia at the end of the palpal tarsus differentiates *C. hurdi* from *C. delitescens*. This difference is especially significant since it shows that the scimitar-like setae found in this position in certain Johnstonianidae are modified eupathidia. Examples of this are found in the larva of *Centrotrombidium distans* (Newell 1957: 418, figs. 28, 29, 30), *Johnstoniana latiscuta* (Newell 1957: 431, fig. 92), and others.

*Charadracarus delitescens* new species

FEMALE: Body (Fig. 31) 513 to 711  $\mu$  long to tip of scutal spine, 270 to 351  $\mu$  wide, length/width 1.87 to 2.02; average 628  $\mu$  by 324  $\mu$ , length/width 1.94 (4 specimens). Sensilla of scutum (Fig. 36) with a fusiform swelling near the middle, this swelling bearing a few minute spines. Basal half of sensillum appearing faintly roughened, and under oil immersion a number of delicate barbs are visible (Fig. 83). Directly anterior to the sensilla are the prosensilla, slightly longer than the other setae. In addition,





FIGS. 50-63. *Charadracarus delitescens*, n. sp., adult, female: 50,  $s_1$ , tarsus I; 51,  $s_1$ , tarsus I; 52,  $s_1$ , tibia I; 53,  $s_3$ , tibia I; 54,  $s_3$ , telofemur I; 55,  $s_2$ , tarsus I; 56,  $s_2$ , tarsus II; 57,  $f_1$ ; 58,  $f_2$ ; 59, genital area, female; 60, coxae III and IV, lateral; 61, tarsus II, posterior; 62, prosoma, lateral; 63, outline drawings of legs I-IV.

there are four or five setae on either side, all of which are very faintly barbed. Anterior to the prosensilla, the scutum narrows to a sharp point which is so closely appressed to the dorsal surface of the propodosoma that it appears to be fused with it. However, the situation is probably the same in the adult as it is in the larva, in which the nasus is actually separate from the dorsal wall of the propodosoma. Between the areolae and extending to the small notch at the posterior margin of the scutum is a weakly defined crista metopica (Fig. 36). The lateral margins of the scutum are indistinct, fading almost imperceptibly into the very faintly striate membranous cuticle around it. Most of surface of scutum delicately punctate, region behind areolae with a number of faint panels. Dorsum of propodosoma with no setae lateral to scutum. Ocular plates completely absent. Dorsal and marginal hysterosomal setae sparse, of two grades, arising from small and only slightly elevated setigerous sclerites, the alveolus lying in the anterior half of the sclerite. Major setae with a strong tendency for the tip to be slightly enlarged and hollow, with a tuft of fine barbs; shaft sparsely barbed along one side. The minor setae arise from smaller setigerous sclerites, and their tips show no tendency toward enlargement. Membranous cuticle with striae visible only under the most favorable conditions. Coxae I with only six to eight setae; supracoxal setae absent. Coxae II with six setae each. Coxae III and IV with about ten and five setae each, respectively; coxal setae with four to eight long barbs. Coxal ring I scarcely closed dorsally, II completely open; III open, IV closed. Pars medialis coxae very faint, containing one or two setae on each side (Fig. 49); intercoxal area with only one or two setae. Other ventral setae with one to six fairly well-developed barbs. A broad transverse band of membranous cuticle behind coxae II devoid of setae. No trace of

*Lassenia*-organ. Genital sclerites greatly reduced and difficult to see, containing only about eight smooth or sparsely barbed setae; paragenital sclerites totally absent. Between the genital sclerites lie the two pairs of acetabula. Genital opening considerably longer than the genital sclerite. Anus a very simple slit with no associated sclerites or setae, lying about half-way between the genital opening and the end of the hysterosoma.

Base of gnathosoma (Fig. 49) with six setae on each side (two specimens). Velum simple, directed anteriorly, a small circlet of fimbriae near the center.

Palpi (Fig. 43) five-segmented, trochanter a short ring, lacking a fenestra on the anterior surface. Femur with four setae, patella with two setae dorsally, tibia with six normal setae plus the heavy terminal odontus. Tarsus with the solenidion near the basal end, a series of three smooth dorsal setae (Figs. 44, 47), plus four other pectinate normal setae; terminal eupathid not hollow. Tip of tarsus drawn out into a narrow bladelike point as in the larva of this and other genera of the Johnstonianidae.

Femora I and II divided, III and IV undivided. Eupathidia confined to tarsi; vestigial setae absent. Tarsus I (four examined) with a single  $s_1$  at 0.63–0.69*d* and typically with two  $s_2$  between 0.62 and 0.67. Famulus<sub>1</sub> at 0.74–0.76. About 20 eupathidia present, lying between 0.57–0.60*v* and 0.63–0.79*d*. Tarsus II (five examined) with a single  $s_2$  at 0.50–0.56*d*,  $f_2$  at 0.37–0.52*d*, and a single eupathid at 0.85–0.88*p*. Tarsi III and IV each with a single  $s_3$  at 0.13–0.19. Other specialized setae as shown in table. All tarsi with two simple claws, the posterior one slightly larger and more erect than the anterior one.

Chaetotaxy of legs approximately as shown in table ( $s$  = solenidia,  $e$  = eupathidia,  $f$  = famulus,  $v$  = vestigial setae,  $n$  = normal setae).

	tr	bf*	tf*		pa		ti		ta						
	n	n	s <sub>3</sub>	n	s <sub>3</sub>	v	s <sub>3</sub>	s <sub>4</sub>	s <sub>1</sub>	s <sub>2</sub>	s <sub>3</sub>	s <sub>4</sub>	e	f	
I	1	4, 5	1	9, 10	5, 6	0	2, 3	3	1	2, 1	0	7	20	1	
II	1	3	0	7	2	0	1	1	0	1	0	1, 2	1	1	
III	2			10	2	0	2	0	0	0	1	0	0	0	
IV	3			8	2	0	2	0	0	0	1	0	0	0	

\* Fused in legs III, IV only.



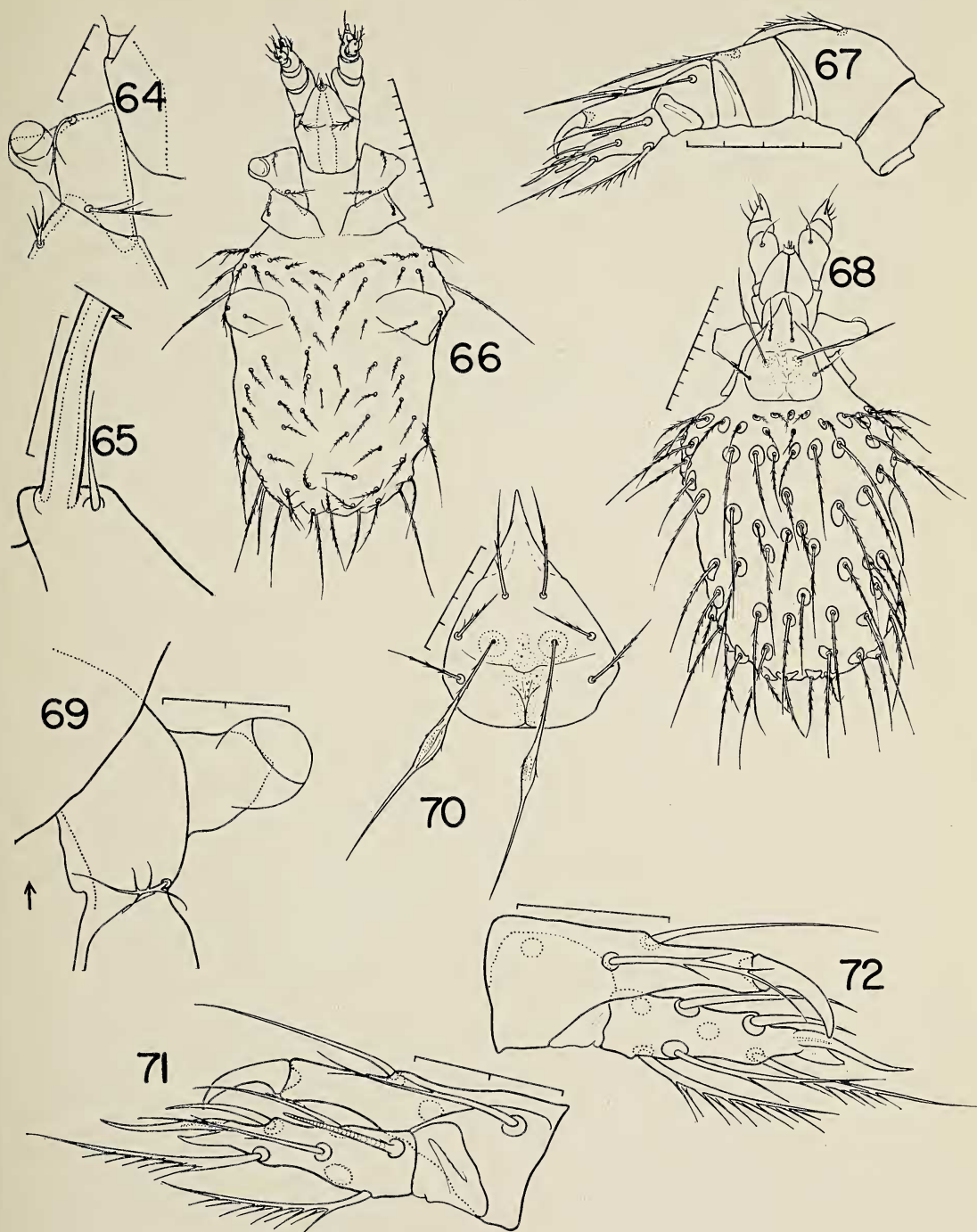
**MALE:** Very similar to female in most respects except for form of genitalia. Genital sclerites crescentic in form, faintly punctate, bearing nine slender smooth setae each; paragenital sclerites completely absent. A small internal corona bears only three pairs of setae which are readily visible, although others may be present. Only two pairs of acetabula present. Anus very small, lacking setae or sclerites.

**LARVA:** Idiosoma 253–324  $\mu$  long to tip of scutal spine, 152–202  $\mu$  wide, length/width 1.53–1.76; average 295  $\mu$  long, 179  $\mu$  wide, length/width 1.65 (seven specimens). Scutum (Fig. 70) with four pairs of setae, the sensilla elongate, fusiform, bearing a number of barbs on both stalk and spindle. The spindle is collapsed in specimens mounted in Hyrax and sometimes even glycerine, but it is fully expanded in specimens in alcohol and Hoyer's medium. The other three pairs of setae on the scutum are similar in form, although the anterior setae (prosensilla) are somewhat longer than the others. Just anterior to the prosensilla, the scutum is drawn out into a very sharp tip, which in the living mite and in all preserved specimens seen by the writer is so closely applied to the dorsum of the propodosoma that it *appears* to be rigidly fused with the latter. This is in marked contrast with the situation in most other Johnstonianidae in which the nasus lies more or less free of the dorsal wall of the propodosoma. However, in dissected material, and in material mounted in Hoyer's medium, the nasus is seen to be a freely projecting spine. Behind the areolae is a transverse ridge or sharp declivity, and behind this a rudimentary crista metopica. A few irregular panels and minute punctae are present. Ocular plates absent. Dorsal and marginal setae arising from individual sclerites, the alveoli lying in the anterior half of the sclerite. Shaft with a number of minute barbs. The dorsal setae at the anterior margin of the hysterosoma are appreciably smaller than the others. Dorsal and marginal setae numbering 63 and 68 in the 2 specimens counted. Membranous cuticle mostly devoid of striae, although a few can be seen occasionally.

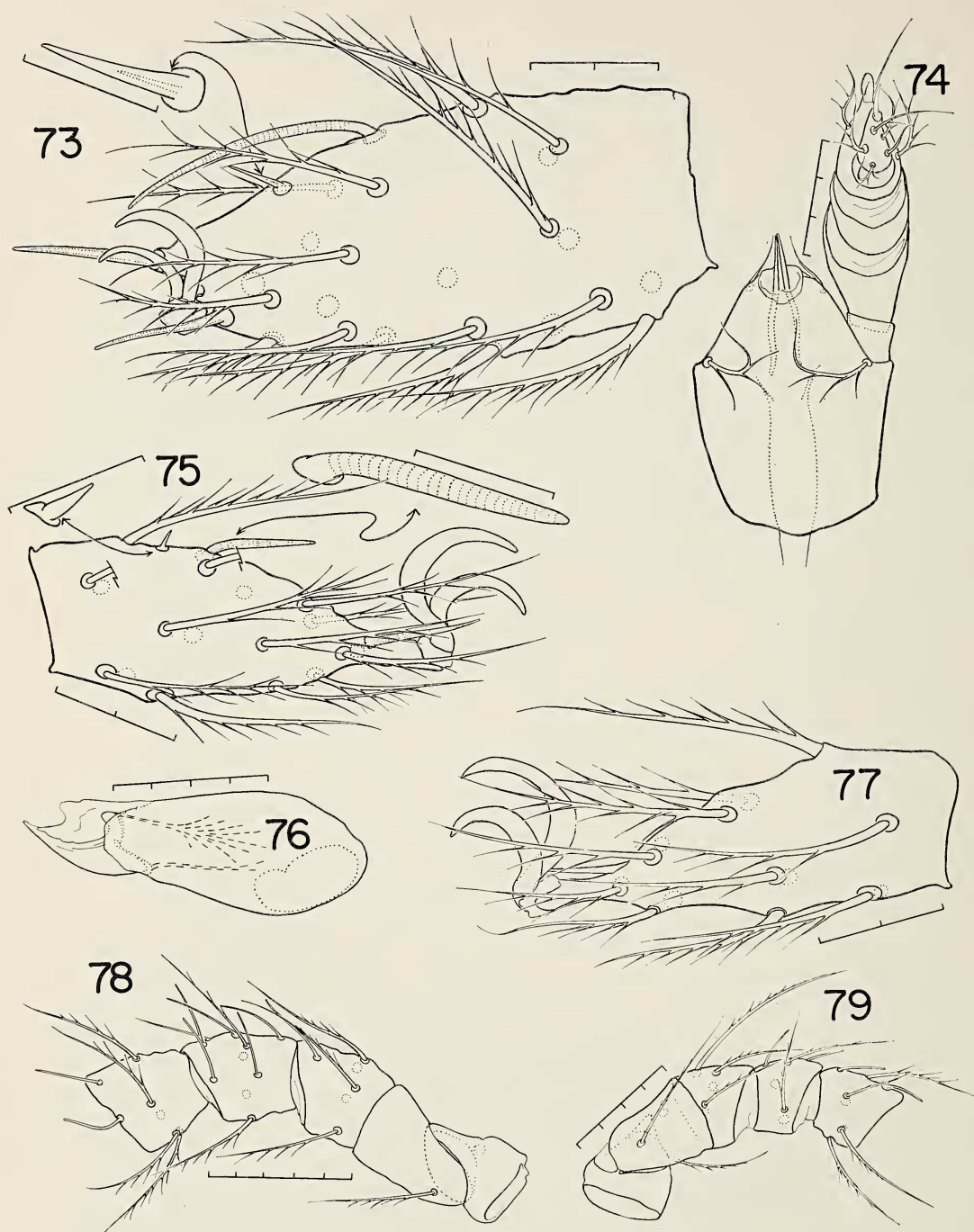
Coxal setae numbering 2–1–2, all slender, tapering, and bearing a number of fine barbs. The configuration of coxae I and II is markedly

different from other genera of the Johnstonianidae, notably in the strongly transverse distal margins of I, the projecting lateral angles of I, and the exceptionally long medial margin of II. Supracoxal seta absent from I, coxal rings I and II both open dorsally, III with coxal ring very feebly developed dorsally. The urstigma is strongly protruded, the terminal portion hemispherical, attached to a stalk (Fig. 69). Membranous cuticle between coxae II and III with 21 ventral and marginal setae in each of the two specimens checked; 6 setae between coxae III of right and left sides. The same two specimens had 30 and 35 ventral setae behind coxae III and a total of 93 and 103 postscutal and postcoxal setae. The setigerous sclerites (omitted from Fig. 66) from which the ventral setae arise are smaller and much less distinct than those on the dorsal surface, as are the setae themselves. Anal anlage a simple line. No *Lassenia*-organ could be found in any of the specimens studied.

Base of gnathosoma without ventral setae (Fig. 74), supracoxal setae absent. A pair of setae laterally at base of rostrum, presumably the tritorostrals. Deutorostrals apparently absent, protorostrals slender, smooth. Velum simple, directed anteriorly. Chelicerae (Fig. 76) with ventral margin of distal membrane closely applied to the dorsal surface of the tarsal claw (in Hoyer's mounts, this membrane is distorted and lies free). Dorsal margin of tarsus with four sharp teeth visible under oil immersion. Palpi distinctly five-segmented, normally oriented. Trochanter a short cylinder without fenestra on anterior surface. Femur and patella with a single dorsal bihemipectinate seta; tibia with 3 slender setae plus the unidentate terminal odontus, which ends in a single point. Anterodorsal and posterodorsal setae of tibia with one to three delicate barbs, dorsal seta of tibia smooth. Tarsus of palp with solenidion at 0.09*p* and three setae at 0.30, 0.60 and 0.82*d*, these becoming progressively heavier toward the distal end. Beyond 0.82, the tarsus is continued as a thin sharp blade. In addition there are four other pectinate normal setae as shown in the figure. Morphologically, the palp of *Charadracar* is virtually identical with that of both *Centrotrombidium* and *Diplothrombidium*; however the most distal dorsal seta is not flattened as in those genera,

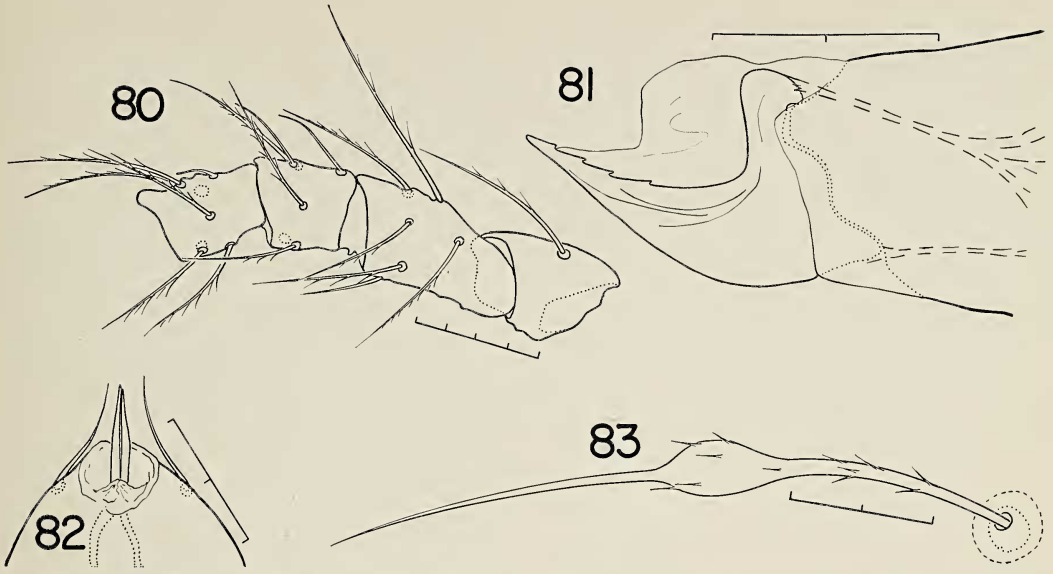


FIGS. 64–72. *Charadracarus delitescens*, n. sp., larva: 64, coxa I and urstigma; 65, base of  $e_a$  of tarsus I; 66, venter; 67, palp, posterior; 68, dorsum; 69, urstigma, left side, ventral medial view; 70, scutum; 71, tibia and tarsus of palp, posterior; 72, tibia and tarsus of palp, anterior.



FIGS. 73-79. *Charadracarus delitescens*, n. sp., larva: 73, tarsus I, posterior; 74, gnathosoma, ventral; 75, tarsus II, posteroventral; 76, chelicera; 77, tarsus III, posterior; 78, trochanter-tibia I, posterior; 79, trochanter-tibia II, posterior.





FIGS. 80–83. *Charadracarus delitescens*, n. sp., larva: 80, trochanter-tibia III, posterior; 81, tarsus and membrane of chelicera; 82, tip of rostrum, ventral; 83, sensillum.

but is cylindrical at the base, tapering gradually to a fine point. Podocephalic canals absent.

Legs I and II with basifemur and telofemur distinctly separated from each other, III with femur undivided, so that legs I and II have six free segments beyond the coxa while III has only five. Vestigial setae absent from patella and tibia of all legs; eupathidial formula 2–1–0. Tarsus I with solenidion at 0.51–0.59,  $f_1$  at 0.67–0.77,  $e_1$  and companion seta at 0.95–0.98; averages 0.55, 0.72, and 0.97 respectively (ten tarsi I). Tarsus II with  $f_2$  at 0.32–0.39,  $s_2$  at 0.40–0.47; averages 0.36 and 0.43 respectively (nine tarsi II). Other chaetotactic features of legs as shown in table. All tarsi with two claws, the posterior more erect than the anterior.

TYPE LOCALITY: Angeles National Forest, Los Angeles County, 2.1 miles (by road) northwest of Big Pines Ranger Station. Under black oak litter on north slope. June 10, 1957, collected by the writer.

*Charadracarus grandjeani* (André) 1930,  
new combination

*Typhlothrombium grandjeani*, André, 1930:  
527–531.

*T. grandjeani*, Thor and Willmann, 1947: 219–  
220.

*T. grandjeani*, Cooreman, 1954: 14–17.

This is a humus inhabitant, collected in the park at Versailles, France, under "rouseux." André described their color as "... rouge pale, blanchissant rapidement dans l'alcool." *C. delitescens* is not colored in the living state, except for the yellowish sclerotized areas.

André's description was based on the adult, not on nymphs. The presence of only two pairs of genital acetabula in the Johnstonianidae generally indicates a nymph, but *Charadracarus* is an exception. André described a well-developed spiniform seta anterodistally, in addition to the odontus and four long setae, making a total of six for the segment. The writer has studied the type slide, and the "spiniform seta" actually is only a little shorter than the other setae of the tibia, other than the odontus, and has the same form as in *C. delitescens* and *C. burdi* (Figs. 7 and 44 of this paper).

*Charadracarus aelleni* (Cooreman) 1954,  
new combination

*Typhlothrombium aelleni*, Cooreman, 1954: 14–  
17.

This is a cavernicolous species from the Jura Range, Switzerland, Grotte de l'Echelette, alti-

tude 1220 meters. It is the only one of the four species in which there is a well-developed paradont on the tibia of the palp. It resembles *C. delitescens* and *C. grandjeani* in the fusiform sensilla. It resembles *C. hurdi* in the filiform shape of the major setae. Whether or not the paradont is a new seta in this species or whether it is a modified normal seta is difficult to say. Cooreman showed three normal setae on the posterior surface of the palpal tibia and two on the anterior surface, in addition to the odontus and paradont, making a total of seven setae for the tibia. In the other three species, there are six setae in addition to the odontus, but none of these assumes the character of a paradont.

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